REMARKS/ARGUMENTS

In the amended claims, independent claims 1, 19 & 20 have been amended to distinguish the invention more clearly from the cited references, and new claims 35-55 directed to specific embodiments of the invention have been added.

More particularly, independent claims 1, 19 and 20 have been amended to recite that "an area of a surface on one side of the substrate" is exposed to or irradiated with "a patterned laser beam bearing the pattern of the desired diffractive device" (claims 1 and 19) or "bearing the pattern of the desired polarization pattern" (claim 20), as suggested by the Examiner in the Office Action of March 12, 2004.

Novelty Rejections

Rejection of Claims 1-17

These claims were rejected by the examiner as anticipated by DE 29805481. This German document discloses a hot embossing film which comprises a carrier film (1) and a detachable decorative layer (3) divided into individual patches (2) which can be transferred to a substrate by use of heat and/or pressure. Three areas (4) may be created by removal of edge material around each patch. Removal of the decorative material layer (3) can be by a laser (10, 11) which then passes through the transparent carrier film (1). Thus, the laser does not actually form an optically diffractive structure in a surface of the substrate. There may be a pre-formed optically variable device, such as a hologram, in thermally formable layer (6) and metal layer (8), but the laser is used only to form free areas (4) between the patches (2) which may contain holograms, so that the holograms can be divided or separated.

The Examiner objected that the claims as filed were open to ablative modification of an intermediate to form the final diffractive article, and suggested that the applicant could obviate this rejection by modifying the independent claims to indicate the "patterned laser beam bearing the pattern of the desired diffractive device". It will be seen that the applicants have adopted the Examiner's suggestion in this regard, and it is submitted

that amended claim 1, and claims 2-17 dependent thereon, are novel having regard to DE 29805481.

Amended Claims 19 and 20

Although DE 29805481 was not cited against independent claims 19 and 20, it is submitted that those claims which have been amended in similar manner to claim 1 are also clearly novel having regard to DE 29805481.

New independent claims 35 and 43

New claim 35 is directed to a method of producing a security document or device comprising a transparent plastics substrate and a transmissive optically diffractive device, in which an area of a surface on one side of the transparent plastic substrate is irradiated with a patterned laser beam to ablate selected portions of the substrate and thereby form a transmissive optically diffractive structure in said surface.

DE 29805481 only discloses a hot embossing film carrying a reflective optically variable device which includes a reflective metal contrasting layer (8). It is therefore not relevant to the formation of a transmissive optically diffractive structure as claimed in claim 35.

Independent claim 43 is directed to a method of producing a security document or device comprising a transparent plastics substrate and a reflective optically diffractive device formed by irradiating an area of a surface on one side of the substrate with a patterned laser beam to form an optically diffractive structure, wherein the security document or device includes a reflective layer in at least the area of the optically diffractive structure. This claim also includes the limitation of the "patterned laser beam bearing the pattern of the desired diffractive device", and is therefore clearly novel having regard to DE 29805481.

Claims 36-42 are dependent on claim 35 and claims 44-50 are dependent on claim 43.

Other rejections of claims 1 to 18

The Examiner has objected to original claims 1 and 3-6 as being anticipated by **JP 05-040936**. This Japanese document discloses the formation of a reflection-type diffraction grating using primary reflected and diffracted beams which are scanned in a stripe shape manner. Thus, the laser beams effectively move to write the required diffractive line pattern, and do not constitute "a patterned laser beam bearing the pattern of the desired diffractive device", as claimed in claim 1. This distinction is further emphasized by dependent claim 2 which relates to placing a mask in the path of laser radiation to create the patterned laser radiation bearing the pattern of the desired diffractive device. There is no disclosure of the use of a mask in JP 05040936.

The Examiner also rejected original claims 1, 3-4 and 13 as being anticipated by **GB 2222696**. This cited reference relates to the production of holographic gratings in materials using a pulsed excimer laser source and a Fresnel biprism to divide the wave front of the laser output into two beams which are arranged to interfere to fabricate a diffraction grating in the surface of the substrate. Thus, neither of the two halves of the laser beam as produced by the biprism in GB 2222696 actually bears the pattern of the desired diffractive device. It is only when the two halves of the beam interfere that the grating is etched on the surface of the substrate.

It is therefore submitted that amended claim 1 is novel having regard to GB 2222696.

It is further submitted that dependent claim 2 is clearly novel having regard to GB 2222696 which does not disclose the placement of a mask in the path of laser radiation to create the patterned laser beam bearing the pattern of the desired diffractive device.

It is further submitted that the use of a mask to create a patterned laser beam bearing the pattern of the desired diffractive device is advantageous over the beam splitting method of GB 2222696. The use of a mask to create a patterned laser beam overcomes depth of field errors and results in improved production tolerances over the method of GB 2222696.

The Examiner has further objected to claims 1-4 as being anticipated by **JP 10-113780**, as teaching the use of masked laser exposure to machine (ablate) grating patterns. In this regard, it is to be noted that JP 10-113780 solves the problem of making a highly precise diffraction grating by inserting at least two masks or more into the optical path of a laser beam. The plural masks (5a), (5b) are formed by preforming plural slit-like transmitting parts onto a flat plate, and the light transmitting part formed by superimposing the masks is controlled so as to have a precise width with a mask driving mechanism (6). Thus, the individual masks in JP 10-113780 do not "bear the pattern of the desired diffractive device", and it is submitted that claims 1 and 2 are novel having regard to JP 10-113780. Further, it is submitted that new claim 35 is distinguished from JP 10-113780 which does not apparently disclose the formation of a transmissive optically diffractive structure in a security document comprising a transparent plastics substrate.

In paragraphs 10 and 11 of the Official Action, the Examiner has rejected claims 1-4 and 13 as being anticipated by **JP 10-319221**, stating that this document teaches the use of masked laser exposure to machine (ablate) grating patterns. However, although a mask forms part of the optical system for generating the laser beam, it is noted that the formation of a diffraction grating pattern by irradiation of an ablative film with a reflection film is achieved by movement of the workpiece relative to the mask location, rather than by the use of patterned laser radiation bearing the pattern of the desired diffractive device. This is apparent from the English abstract and paragraph [0042] of the machine translation of JP 10-319221 where it is stated that the processed piece (workpiece) 6 with a reflective film is "fixed on a stage 7 adjustable in the direction of an optical axis, and a pattern is continuously formed by moving the stage 7, if necessary. Accordingly, it is submitted that JP 10-319221 does not disclose the use of "a patterned laser beam bearing the pattern of the desired diffractive device". This is further apparent from paragraph [0039] of the machine translation of JP 10-319221 which states that by the manufacture method of the invention, "it consists of a production process which contraction-projects, or scans a laser beam and

irradiates a space selection target at a substrate, a means to move a substrate to a three dimension, ...".

It is therefore submitted that independent claim 1 and claims 2-4 are novel having regard to JP 10-319221 in that each of those claims recites the use of "a patterned laser beam bearing the pattern of the desired diffractive device". The same is true of independent claims 19 and 43.

It is also noted that each embodiment of the process disclosed in JP 10-319221 involves the use of a reflective film on a workpiece, Therefore, it is submitted that the method of producing a security document or device comprising a transparent plastics substrate and a transmissive optically diffractive device in independent claim 35 is novel having regard to JP 10-319221.

Independent Claims 19 and 20

The Examiner objected to independent claims 19 and 20 and dependent claims 22, 25-28 and 31 as being anticipated by Savant et al (US 5,384,221). Savant discloses the photochromic recordal of data using azo dyes dispersed in polymers using polarized light rotated to one of 32 possible orientations. However, it does not disclose the use of "a patterned laser beam bearing the pattern of the desired optically diffractive device or polarization pattern" as claimed in amended claims 19 and 20. It is therefore submitted that amended claims 19 and 20 are novel having regard to Savant et al.

The Examiner also rejected claims 19, 20 and 22 as being anticipated by the article by G.W. Grime, entitled "Holographic diffraction gratings recorded in Photoresist" (Grime). This article discloses the manufacture of a grating by the recordal in a photoresist of interference fringes produced by two beams 1 and 2 which interfere at the surface of the photoresist. However, Grime does not teach or suggest the use of "a patterned laser beam bearing the pattern of the desired optically diffractive device or polarization pattern as claimed in amended claims 19 and 20.

Inventive Step Rejections

The Examiner has objected to claims 1-18 as being unpatentable over either JP 06-51683, US 4,856,857 (Takeuchi et al) or JP 62-111276, in view of JP 10-319221.

The three patent specifications cited by the Examiner as disclosing translucent/transparent holograms each disclose quite distinct methods of forming the holograms. For example, Takeuchi discloses the use of photo-sensitive materials for formation of holograms, such as silversalts, chromic acid gelatin, thermoplastics, diazo type photo-sensitive materials, photo-resists, strong dialectrics, photochromic materials, thermochromic materials, chalcogen glass, etc. JP 62-111276 discloses the use of a stamper-plate for a hologram being put onto a flat forming-dye for forming a hologram on an opaque dark-plastic body, and JP 6-51683 discloses the use of an "engraved hologram" in lines 2 of paragraph [0009] of the machine translation.

There is therefore no teaching or remote suggestion in any of these three documents that an optically diffractive device can be formed in a surface on one side of a substrate by irradiation with "a patterned laser beam bearing the pattern of the desired diffractive device to ablate selected portions of the surface". Further, there is no motivation in any of these documents to use a laser ablation method for forming the holograms or any suggestion in these documents that it would be obvious to combine the teaching of JP 10-319221, which discloses a quite different method of producing a diffraction grating, with any of these three documents.

Moreover, as discussed above JP 10-319221 teaches the formation of a diffraction grating pattern by continuously moving the stage 7 on which the reflection film is fixed, and there is no disclosure of "a patterned laser beam bearing the pattern of the desired diffractive device". Therefore, quite simply a combination of the teaching of JP 10-319221 with any one of JP 06-51683, Takeuchi et al, or JP 62-111276, would not arrive at the invention claimed in amended claim 1, even if the respective teachings were combined.

It is therefore submitted that the invention as claimed in amended claim 1 would not have been obvious to a person of ordinary skill in the relevant art and involves an

inventive step over either of JP 06-51683, Takeuchi et al or JP 62-111276, in view of JP 10-319221.

Finally, the Examiner has also objected that claims 1-20 and 22-34 as being unpatentable over either of the three references discussed above which are considered to relate to translucent/transparent holograms, in view of the article by Grime and DE 29805481.

As discussed above, neither Grime nor DE 29805481 discloses the use of "a patterned laser beam bearing the pattern of the desired diffractive device or polarization pattern". Therefore, it is submitted that a combination of the teachings of either JP 06-51583, Takeuchi et al or JP 62-111276 with either Grime or DE 29805841 would not result in the invention as claimed in either of claims 1, 19 or 20 as amended. For example, combining Grime with either of the three cited references would merely result in the formation of a transparent or translucent hologram using a method involving the interference of two laser beams, and a combination of DE 29805481 with any of the other three references would merely result in the use of laser radiation to create lines between holographic patches so that the holograms can be easily divided or separated.

As discussed on page 2 of the specification of the present application, advantages of the present invention are that it simplifies the multi-layered structure of a security device when incorporated into a security document or device, and the optically diffractive device or polarization pattern may be easily integrated into the process of manufacture of the security document or device. This is further emphasized by the paragraph bridging pages 9 and 10 of the specification where it is stated that the laser process can be easily integrated into the normal multi-step process during which a substrate is coated or otherwise treated, to produce a security document, such as a banknote or the like. The method of the present invention eliminates the need for a separate manufacturing process to produce an optically diffractive device on a transfer foil and the separate hot stamp foil transfer process required to transfer the diffractive device onto the product.

A further advantage provided by the placement of a mask in the path of laser radiation to create the patterned laser beam bearing the pattern of the desired diffractive device (or polarization pattern) over the use of two split beams which produce a grating by interference, such as disclosed in Grime and in GB 2222696 is that the patterned laser beam produced by the mask overcomes possible depth of field errors and has better production tolerances.

Having regard to the above, it is respectfully submitted that the invention as claimed in each of the independent claims as amended is not only novel but also is non-obvious and involves an inventive step over all of the cited references, whether considered individually or in any combination.

It is further submitted that several features of the dependent claims also provide advantages in the present invention. For instance, the advantages of the use of a mask to produce the patterned laser beam bearing the pattern of the desired diffractive device or polarization pattern have been discussed above. Further advantages are conferred by the different embodiments of the claims in which the optically diffractive structure may be either a transmissive optically diffractive device provided either directly in the transparent plastics base substrate itself (dependent claim 38), or in a transparent coating applied to the base polymeric film material (dependent claim 40). The optically diffractive device may alternatively be a reflective device as claimed in new claim 43, with the optically diffractive structure being formed either directly in the transparent base substrate or in a transparent coating applied to the base substrate, with the reflective layer subsequently applied over the optically diffractive structure. A further alternative is for the optically diffractive structure to be formed by laser ablation of a reflective layer applied to a transparent plastics substrate as claimed in dependent claim 47.

Finally, new claims 51-55 have been added which are directed to a security document or device made by the methods of independent claims 1, 19, 20, 35 and 43 respectively. It is submitted that the addition of these claims does not constitute added subject matter. For example, we refer to the paragraph abridging pages 9 and 10 of the

specification which refers to the laser "method, and the security document or device including an optically diffractive device produced by this method".

Information Disclosure Statement

There accompanies this response an Information Disclosure Statement containing references cited in the European patent application. The Information Disclosure Statement, also contains references relating to work on photo-oriented polymer networks carried out by Rolic AG.

In connection with these references, U.S. Patent No. 5,389,698 (Chigrinov et al.) and corresponding European Patent No. EP 0525477, assigned to Rolic AG are noted. This patent discloses a process for making photopolymers in which a layer of photoreactive organic material is disposed on a substrate (e.g. a glass plate) provided with an electrode layer. The layer is illuminated with plane-polarised light through a lens, optionally with a mask in front. The light comes from a polariser illuminated with non-polarised light (UV laser).

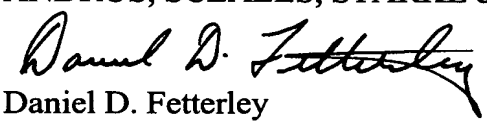
Amended claim 20 which specifies "a patterned laser beam bearing the pattern of the desired polarisation pattern" is distinguished from the two alternatives for illumination disclosed in U.S. 5,389,698, i.e. non-polarised UV light through a mask, and the interferometric imaging process using linearly-polarised light without a mask.

Conclusion

Withdrawal of the rejections and passage of this amended application to allowance is respectfully requested.

Respectfully submitted,

ANDRUS, SCEALES, STARKE & SAWALL, LLP



Daniel D. Fetterley
(Reg. No. 20,323)
100 East Wisconsin Avenue, Suite 1100
Milwaukee, Wisconsin 53202
(414) 271-7590

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Daniel D. Fetterley	20,323
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Daniel D. Fetterley	7/12/04
Signature	Date